

日本域における静止衛星画像解析と時系列データに内在する隠れた周期性 Satellite Image Analysis for Channels covering East Asia Region and Hidden Periodicities for Time Series Data

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Image analysis and time series analysis for MTSAT-2 images covering East Asia region of channels (IR1 and IR3) are discussed. The new time series data derived from fractal analysis of the time series images illustrated in 600x462 pixels from 2009 to 2010 are generated and power spectra for the ratio of cloud covers, water vapor, and space packing exponents with periodic peaks are calculated by using Fourier transform and periodicities of peaks in autocorrelation function are analyzed.

Chaotic behaviors of orbits for their time series data restructured with three dimensional space of states are observed. The branch points of the system, the points of intersections where the amplitude of the fluctuations in four moving average curves become smaller at the same time, are evaluated with the time interval related to the periodic peaks. The features of the branch points and between the ratio of cloud cover or the ratio of water vapor and the space packing exponent are described.

Correlations between time series data of hourly air temperature from 1991 to 2010 observed at Kobe station and Niigata station are discussed.

For time series data of hourly air temperature in 1996, 2000, 2009, and 2010, power spectra with periodic peaks are calculated by using Fourier transform, respectively. A first peak of power spectra is determined and time intervals between nearest neighbor peaks are evaluated. As a result, hidden periodicities are observed. In addition, the features of power spectra for the ratio of cloud covers and space packing exponents by image analysis and time series analysis for MTSAT-2 images covering East Asia region of channels IR1 in 2009 and 2010 are described and similarities between the hidden periodicities for time series data of hourly air temperature are suggested.

Keywords: MTSAT-2 images, Time Series Analysis, Fourier transform, continuous wavelet transform, hidden periodicities